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AUTHOR Suomala, J. A.; Korhonen, R. B.; Ketamo, H. C.
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ABSTRACT

This paper explores whether new information technologies are appropriate for use with young children. The paper concentrates on theories related to young children's use of "new media." Sections are: (1) "Defining the New Media by Its Functions"; (2) "Constructivism and Interaction with New Media"; (3) "The Dimensions in the New Media Input" (discussing an active-passive dimension and a static-dynamic dimension); and (4) "New Media Helps a Child To Be As a Scientist." The concluding discussion asserts that both passive and interactive new media products can be useful teaching tools and that new media products, particularly interactive ones, can motivate children more than traditional learning materials. (Contains 27 references.) (EV)

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New media in early childhood education

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Suomala, J[a]., Korhonen, R [b]. & Ketamo, H[c].
jyrki.suomala@utu.fi[a], riitta.korhonen@utu.fi [b],
harri.ketamo@utu.fi[c]
University of Turku, Department of teacher education in Rauma.

Abstract

Rapid development of Computer Technology and Data Communication has made the revolution of Information Technology (IT) possible. Major changes has been achieved in different areas of Media via IT. IT consists all the technical equipments and software that are transfering information, for example workstations, servers, network, routers, repeaters and cabels. Operating system, www-browsers, workgroup programs and programs for videomeeting are softwares for IT. By beginning to use new technologies we have changed practicies of producing, storing, transfering and receiving information. We can say that storing and transfering data has been improved by using IT. But we cannot be sure what affects has the development of IT to our ability of accepting information. We are talking about "infobloat" (Koski 1999) and float of information which is recessing the ability of thinking. It seems that we have not yet solved the problem how to know, understand and learn. It seems to be clear anyway that new media great affect, for example, to the way how children play and more commonly, how do they form their consciousness of reality. In this paper it is concentrates to describe the characteristics of new media that can improve a child to develop thinking. It is described these features here from the point of view of education and psychology of thinking.

Keywords: new media, interaction, thinking, activity of child

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Introduction

Terminology in information technology has rapidly developed during the last decade. The new media is a term with many definitions; sometimes it is defined as multimedia or hypermedia.

Multimedia is considered as the combination of text, pictures, moving pictures and sound in one document. Hypertext is the linked structure in a document and the hypermedia is the combination of both multimedia and hypertext. It is also said that all digital media is the new media. The new media as a term might be more descriptive and useful if it is defined by its function, not by techniques. There is alsoa very short lifecycle for those technology-based new media definitions, because in a short time all "electronic" media (tv-s, radios etc.) will start to use digital broadcasting and there will then be no more new media in meaning of its technology-based definition. In this paper, we define the new media from the constructive viewpoint, which is useful for the human research, such as learning, but it might give new views for technical and commercial research as

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well. By trying to find and determine functional differences between the traditional media and the new media, we can find definitions for the new media which are not dependent on technology and which may also be used in the future.

New media is part of children's everylife live. Children have a natural attitude towards new media. A user-friendly interface with graphics, texts, and still images such as photographs, animation, audio, and motion video make new media easy and interesting to use. However, we should ask basic question about new media: Is their use appropriate for young children? And, what kind of new media is suitable for young child. By answering these basic questions, we have developed in department of teacher education in Rauma (University of Turku) conceptual tools concerning the learning effects of new media. We have collected three empirical material concerning to young children's new media use (1.Open-ended problem solving in the screen Logo learning environment, 2.Aleksis multimedia learning and 3.WWW-based geometry learning). The empirical results of study one has published earlier (Suomala 1996) and other two studies are underway. This paper concentrates theoretical ideas relating to young children's new media use.

Defining the new media by its functions

The term media is understood as being the transportation of information to large groups of people. This information transportation can be done in many ways: As printed texts or pictures, as electro-magnetic analogue signals (example most TV- and radio programs now) or as electro-magnetic digital signals (data in networks).

When considering media as a system with inputs and outputs, we can focus on the media's functional preferences. In the traditional media, the document producer makes all input and the recipient cannot affect the output. There is only one output for all recipients (see figure 1). The document is used here to describe all media type, such as newspapers, radio, television and program code for computers. The document is seen as a part of media. Those interactive games shown in the TV or request concerts on the radio where few people can participate in the show by phone or letters, do not conflict with this definition. In these cases, input given by a participant focuses on a document producer who adds this input to a part of media output. Therefore, the input does not focus on the media itself. In addition, there are very few people who can affect the media output, for most of recipients there is no opportunity to affect media output.

The activity with traditional media is relatively passive. User only receive information or in the case of early version of educational software, s/he respond to questions. There are few degrees of freedom in what they do, and no opportunities invention, for shaping the media to make their own products or achieve their own goals.

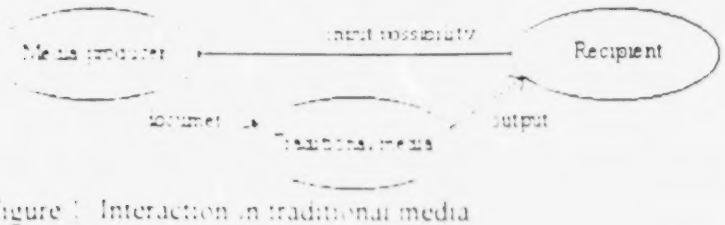

Figure 1. Interaction in traditional media

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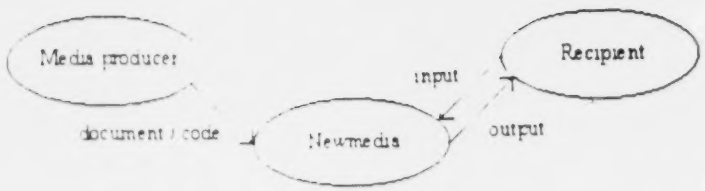

Figure 2. Interaction in new media.

In the new media, the most important preference in the interaction between the media and the recipient is the input that gives such a possibility so that every recipient can make her own document that is different for different persons.The document can also be different to same person at different times (see figure 2). In the new media the input focuses on the media itself and the degree of versatile interaction increases. New media document increases both the quality and quantity of information that can be exchanged between document and user (See Roling and Robinson 2000). In this way, new media in education very likely have a favourable impact on the way young children learn..

The role of new media users is more active compared to the role of traditional media users. Documents in new media are easy to revise, transfer, send , copy and connect to the other new media documents. These versatile possibilities give for a child many different kinds of activities, which has been earlier very difficult or impracticable to implement. In this paper, we are thinking about early chilhood education and new media from the constructivism point of view. In addition, the possibility for active interaction with new media document, makes different personal learner styles possibility (Turkle & Papert 1990).

Constructivism and interaction with new media

The high level of children's activity in comparison with traditional learning situation is the main argument for using information technology in education. Multimedia learning theory (Moreno & Mayer, 1999), computer quide building environments like LEGO/Logo (Resnick, 1996; Suomala, 1999) and intra- or internet based social knowledge building computer tools like CSILE (Bereiter & Scardamalia, 1993), are all examples of good attempt to increase the active involvement of students' learning. From a very broad perspective, all previously mentioned IT-solutions are based on constructivism.

According to constructivism, people construct their own knowledge (Resnick, 1989; Phillips, 1997). This means that construction process is active in the nature and students' understanding is tied up with his or her previous experience. Thus, learning is a

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constructive process, where students actively construct their knowledge through interaction with the environment and through reorganisation of their mental structures (Chi & Bassok, 1989). The learners are builders of knowledge structures rather than the recorders of information (Mayer, 1992).

Constructivism is not an integrated theory. Roughly speaking, constructivism can be divided into cognitive constructivism and social constructivism (Phillips, 1995; Phillips, 1997). Both cognitive constructivism and social constructivism share views on the active role of the learner. However, both schools emphasize in different ways the nature of learners' activity. Cognitive constructivists are concerned with individual activity, when they construct and store knowledge in their inner mental structure (Phillips, 1997). In addition, psychological mechanisms that are responsible for this constructive activity, are essential and the cognitive constructivists give priority to individual students' sensory-motor and conceptual activity (Cobb, 1994). Even though some of the cognitive constructivists concentrate on the social influence for individual activity, their focus of interest is the inner psychological life of individuals (Phillips, 1997). Multimedia learning theory is good example of the IT-application, which is based on cognitive constructivism (Moreno & Mayer, 1999).

The social constructivists are interested in how public bodies of knowledge are constructed (Phillips, 1997). Their main focus is public understanding available in a culture. Learning is seen as an enculturation process in which an individual constructs his/her understanding to be in interaction with other individuals. Onwards, social constructivists link students activity in culturally organised practices (Cobb, 1994). From this perspective, the main issue is that of explaining how participation in social interactions and culturally organised activities influences an individual's development (Cobb, 1994). Learning occurs when individuals constructed knowledge and understanding by engageing in social discussion and activity concerning shared problems and tasks (Driver, Asoko, Leach, Mortimer & Scott, 1994). Paperts' (1980) idea of the LOGO learning environment and Bereiter's and Scardamalia's (1993) CSILE-based learning environments are good examples of the IT-applications, which are based on the idea of social constructivism.

The educational use of new media applications can argue for constructivism. Figure 2 shows, how it is possible to increase a recipient's activity with the new media. However, when we examine the pedagogical use of the new media, it is important to make the separation between different kinds of activity. Mental activity (minds-on activity) refers to the level of the recipient's inner thinking activity. In contrary, physical activity (hands-on-activity) refers to situations, in which an external observer can see this activity. As figure 2 shows, with the new media, a recipient can influence by input the content of new media. At least in this meaning a recipient's physical activity increases compared to the traditional media. However, this does not guarantee that an individual's cognitive activity or learning quality increases.

The dimensions in the new media input

When focusing on the activity of user, two dimesions of the quality of recipients' input can be presented: the active-passive and static-dynamic dimensions (Figure 3).

Active-passive dimension. *The active input* means a situation, where input requires reflection of current and following media output. The active input is represented

by the high-quality computer games and also by the new learning environments, such as LEGO/Logo and CSILE. In addition, the keyword search in the internet requires the active giving of input. *The passive input* means situations in which a recipient can choose a new input without observing and thinking of previous media output. Thus, the giving input does not require previous experiences or previous knowledge and even the new media output does not require present information. *The passive input* is represented by those www-documents which can be seen with "click the mouse and see what is coming" -method. For learning, the passive input in new media documents can be seen quite like traditional printed learning materials. The active input may contain more versatile opportunities for learning.

Static-dynamic dimension. *The static input* means situation, where same input gives always same output. The static inputs are so called "clicking" links in the internet, which give always the same asked site. Also the internet keyword search is static, because with the same words and rules a search engine does the same search. The media output could change because there could be different documents in the internet, but the operation itself is always the same. *The dynamic input* means situation, where the media output depends on many inputs or the media output is controlled with some logical variables. For example, playing strategy games require dynamic input, because playing is strongly depending on tens or even hundreds of inputs and variables. In addition, learning within new socially learning environments require dynamic input, because learning in these environments is depending on other learners' inputs. For learning, the static input can be used for performing different logical operations, whereas the dynamic input can give practice in problem solving.

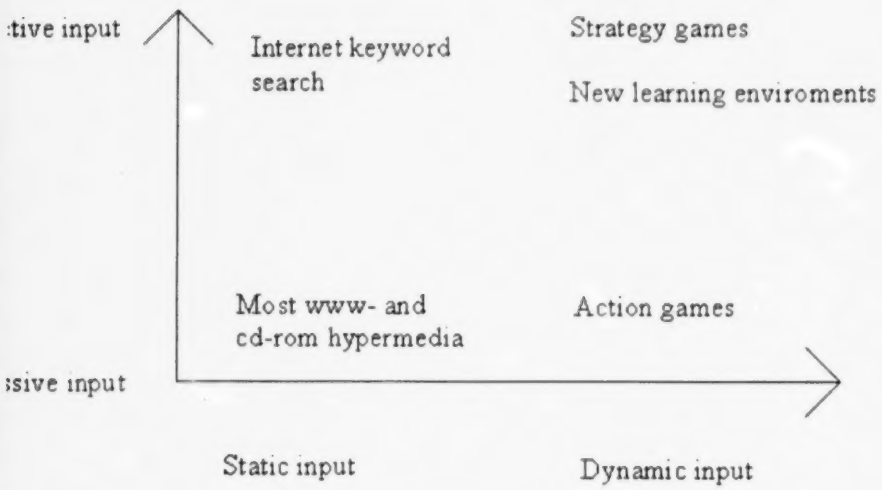

Figure 3. The dimensions in the new media input.

When different new media products are placed in a diagram by active-passive and static-dynamic dimensions, their constructive preferences can be seen more clearly (see figure 3). The active documents placed in the top of a diagram, may contain more opportunities for learning, though passive material may also be very useful for a professional teacher.

There are quite different examples in the diagram. The CD-ROMs and www-multimedia might easily represent passive and static input. Input is passive when

navigation in a document's structure can be done without observing the document's information and is static if the same link or operation always gives the same result. The active and static input represent new media products, which cannot be used without observing documents' information (F.ex. Internet keyword searches). The passive and dynamic input can be found from so called action games where player can control many inputs without any reflection. Strategy games usually requires active observation and reflection, they represent active and dynamic input in the new media. Naturally there are whole "greyscale" for new media products and sometimes placing a product to diagram can be difficult.

New media helps a child to be as a scientist

There appear to be two broad ways in which human beings organize and manage their knowledge of the world: scientific thinking and narrative thinking (Bruner 1996).Scientific thinking focuses on the physical world, whereas narrative thinking focuses on feelings and on other peoples actions. Narrative thinking helps children create personal view of the world in which they can envisage a place for themselves (Bruner 1996).

Traditionally, young children has been seen as incapable of demanding higher-order thinking such as scientific reasoning (Inhelder & Piaget 1958, Vygotsky 1982, Kuhn 1989). According to this traditional view, in some very basic respect children do not think like scientists. However, currently many studies have shown, that young child is capable of many cognitive activities at first thought accessible only to older children. According to this "child-as-scientist" view children create and revise theories in the same way that scientists create and revise theories (Gopnik, Meltzoff & Kuhl 1999, Hatano & Inagaki 1995, Klahr 2000, Sodian, Zaitchik & Carey 1991; Wellman & Gelman 1992). The basic idea of the child-as-scientist is, that children use the same cognitive processes as scientists do in making sense of the world and in generating new knowledge about it (Brewer & Samarpungavan 1991 ,Gopnik, Meltzoff & Kuhl 1999). Very young children demonstrate surprising competence at formulating theories (Brewer and Samarpungavan 1991, Wellman and Gelman 1992), reasoning about critical experiments and evaluating evidence (Fay & Klahr 1996). A child-as-scientist view includes the idea, that during learning process child does not only learn facts about environment but in the same time s/he forms theory and beliefs about the concept of knowledge. Using new media, children can begin to use and begin to understand metacognitive concepts like beleave, think, understand, know, make conclusion, argue and suppose.

It looks like that young children are under certain conditions capable of demanding thinking.. Undoubtedly, the suitable use of new media can facilitate childrens' development. For example, Papert (1980, 1993) has argued, that computers are new cultural artifact, that evoce children's development. The positive effects can also focus for narrative thinking .

The ways in which tasks are structured for young children affect what they are capable to do in this situation. For example, in highly constrained discovery contexts, young children reason correctly about hypotheses and select appropriate experiments to evaluate them (Sodian, Zaitchik, & Carey, 1991). New media can be as a symbolic tool. In this way it can help educators decrease the gap between abstract and concrete knowledge (Papert 1993). Good example is Gordova's and Lepper's study (1996), in which they produced computer learning game, which helped pupils to learn demanding

mathematics concepts. Contextualization, personalization and provision of choices all produces increase pupils depth of engagement in learning and intrinsic motivation (Cordova & Lepper 1996). In addition, pupils learnt more in groups, who played contextual and personal version of this math game. Overall, with the advent of new media, education has become more exciting for pupils of all ages (Boling and Robinson 1999).

New media has many potential opportunies to improve quality of early childhood education. The child- as- scientist view gives educators many positive new opportunies to develop suitable cognitive and narrative tools for young childrens' learning.

Discussion

When thinking about learning opportunities, we can say that many kinds of media with all kinds of interaction can be used in effective learning. The question in this case is more like 'what we would like to teach with the new media product'. Texts and scenarios, such as lightning, can be taught very effectively by quite passive and static new media products (Moreno & Mayer 1999). In these cases we have a clear issue of what we would like to teach, and we can do it with papers, books, TV-programs or new media product. Passive learning material does not have to be worse than material which requires active interaction. When using a new media product that requires active interaction, the product can control learning, but the same control can be done by teacher, when using passive materials. The quality of thinking is not the same as activity of interaction.

Learning of complex concepts or some holistic models with computers has been under research for decades (Clement, 2000). Using a new media product that requires active and dynamic interaction, might create some versatile opportunities for understanding a complex world. For example The Sim Park, strategy game for children, allows the player to control several variables which affects the park ecosystem. Depending on the player's inputs, the life in the park can be life in the real park. Also the park can be destroyed by the player, for example by making some animals populations too big, the ecosystem does not work, and some cast-off follows such input. This kind of products may teach holistic and complex models very effectively, but they do not teach facts or issues in the way that more static and passive materials do.

After all, new media products have one big advantage; they can motivate children more than traditional learning materials. They can also facilitate children to achieve new cognitive skills and make easier to achieve demanding cognitive skills. That is a good reason to develop high quality learning products in which interaction is planned to respond the goal of the learning. Learning itself is a complex process and the interaction itself is not an instrument to make effective learning. However, by using certain type of interaction in learning materials, we encourage humans to adopt the more effective learning process.

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